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(54) COMMUNICATION SYSTEM

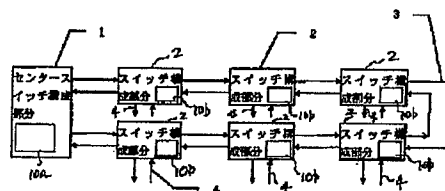
(57) Abstract:

PROBLEM TO BE SOLVED: To provide a communication system having a clock synchronous system that can perform the communication by an AAL1 system, despite the absence of a carrier network clock.

SOLUTION: Plural switch component parts 2, which are connected to a center switch component part 1 via a transmission line 3 send the signals received from the upstream side via the line 3 to the downstream side and also perform the transfer of information to a local communication terminal via input/output ports 4. The part 1 and every part 2 include the clock synchronous

control means 10a and 10b respectively. The means 10a and 10b have the PLL (phase-locked loop) circuits to perform the clock synchronous control, where a clock is extracted and reproduced from the signal received from the upstream side by the PLL circuit and used as the transmission timing for the data, which are turned into a cell and sent to the downstream side.

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CLAIMS

[Claim(s)]

[Claim 1]A communications system comprising:

Two or more node devices by which distributed installation is carried out in two or more parts.

1 or two or more local communication terminals which are connected to each of said node device.

In a communications system which possesses a means of communication which connects said two or more node devices in series, and carries out the transmit receive of the cell-ized data, A clock synchronization control means which relays a clock by extracting a clock from a received signal, reproducing from the upper stream, and using it as transmission timing of cell-ized data to the lower stream.

[Claim 2]Said 2nd means of communication by relaying said clock from the lower stream to the upper stream by doubling a means of communication using two means of communication, the 1st and the 2nd, and said 1st means of communication relaying said clock from the upper stream to the lower stream, The communications system according to claim 1 performing clock relay with which the clock relay direction of said two means of communication disagrees.

[Claim 3]The communications system according to claim 1 or 2 making into a clock source of a transmission line between said node devices a clock extracted from a net etc. which were accommodated in the local communication terminal side.

[Claim 4]A running clock generating means is provided in one node device in two or more node devices, The communications system according to claim 1 or 2 making a running clock of this node device into a network clock source, and other node devices' reproducing a clock from data received from a node device with said running clock, and sending out data to a downstream node device.

[Claim 5]A communications system of claim 2 enabling maintenance of clock relay even when an obstacle occurs by separating a means of communication which an obstacle generated when an obstacle occurs in a part of means of communication, and turning up another [without an obstacle] means of communication to a means of communication which an obstacle generated.

[Claim 6]The communications system according to claim 5 characterized by establishing two or more turning up points of a clock, and enabling it to perform said cuff at any two or more places of a User Network Interface or said node device.

[Claim 7]A communications system of claim 1, wherein a node device is constituted by an ATM switch means which can be adapted for an ATM (Asynchronous Transfer Mode) communication method.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]The case where the source of release or data receiver of data has been arranged at linear shape as for this invention, With respect to the communications system which comprises a communications network which connects them to a data processing center, a data source of release, and a data receiver, it is related with the clock synchronization control for gaining certainly the clock for operation in each above-mentioned device, and the clock cuff control at the time of a transmission line fault in detail.

[0002]

[Description of the Prior Art]As a typical example of the communications system which comprises a communications network which connects them to a data processing center and a data source of release in case the source of release or data receiver of data has been arranged at linear shape, and a data receiver, A road control system, a railroad managerial system, a sewerage managerial system, an airfield managerial system, a river management system, a subway managerial system, etc. are known.

[0003]Drawing 7 is an outline lineblock diagram of these managerial systems, and especially as communication apparatus, such as the above-mentioned data receiver and a data processing center, It is an example of realization of the system concerned at the time of applying the communication apparatus which performs cell transfer using an ATM (Asynchronous Transfer Mode: Asynchronous Transfer Mode) replacement switch. In the figure, the center switch component 1 is equivalent to the above-mentioned data processing center, and the switch component 2 is equivalent to the above-mentioned data receiver. The switch component 1 and the switch component 2 are connected by the transmission line 3, and the local communication terminal equivalent to the above-mentioned data source of release etc. is further connected to each switch component 2 via the input/output port 4.

[0004]In the system of this composition, as composition for the above-mentioned center switch component 1 and the switch component 2 to gain the clock for operation, For example. [whether as shown in drawing 2, it has composition made to operate with a running clock original with each device like a local area network (LAN) and] Or as shown in drawing 3, it is common to adopt the method which uses the clock of a career as a clock master and is synchronized with this clock master.

[0005]However, in the case where it needs to be synchronized on data transfer, for example, between a data source of release and a data processing center by the cell-ized method of ATM, AAL1 Since a unific network clock was needed when adopting a method and carrying out clock reproduction, clock synchronization was not able to be realized depending on composition like the above-mentioned local area network.

[0006]In each above-mentioned managerial system, since the independent channel with which a

career does not exist was used for each network node in almost all cases, necessity was not able to be used for a clock by AAL1 method like the case in a local area network, having extracted from the external career.

[0007] Since the clock system of the communication apparatus which has the conventional ATM exchange switch had taken clock synchronization only between the communication apparatus which counter, it was unsuitable for each above-mentioned managerial system.

[0008] As part of the fault measures in this kind of managerial system, when an obstacle occurs in a transmission line, separate the transmission line which the above-mentioned obstacle generated by cuff of a transmission line, and the method of securing communication is known, but. When such control is ventured, the obstacle was restored, when returning to the usual operational mode, a clock will be lost temporarily, and it will have the serious influence for clock acquisition.

[0009]

[Problem(s) to be Solved by the Invention] Thus, it is a case where the communication apparatus which uses an ATM switch performs a system construction in a system conventionally [above-mentioned], and, moreover, is AAL1. When adopting a method, It was necessary to certainly draw the network clock of a career in each node, and there was a problem that communicative stabilization was dependent on a network clock.

[0010] When separating the transmission line which the obstacle generated by cuff of a transmission line and securing communication, the obstacle was restored, and when returning to the usual operational mode, there was a problem that operation which the clock of was lost temporarily and stabilized could not be performed.

[0011] This invention removes the above-mentioned problem and an object of this invention is to provide the communications system provided with the clock synchronization method which can realize communication with AAL1 method even if there was no network clock of a career.

[0012] An object of this invention is to provide the communications system provided with the clock synchronization method which can continue the communication stable also in the cut return after a part of channel is fallen and restored with an obstacle.

[0013]

[Means for Solving the Problem] Two or more node devices with which distributed installation of the invention of claim 1 is carried out in two or more parts, In a communications system which possesses a means of communication which connects said two or more node devices with 1 or two or more local communication terminals which are connected to each of said node device in series, and carries out the transmit receive of the cell-sized data, A clock synchronization control means which relays a clock is provided by extracting a clock from a received signal, reproducing from the upper stream, and using it as transmission timing of cell-sized data to the lower stream.

[0014] In an invention of claim 1, an invention of claim 2 a means of communication, Said 2nd means of communication by relaying said clock from the lower stream to the upper stream by doubling using two means of communication, the 1st and the 2nd, and said 1st means of communication relaying said clock from the upper stream to the lower stream, Clock relay with which the clock relay direction of said two means of communication disagrees is performed.

[0015] An invention of claim 3 makes a clock extracted from a net etc. which were accommodated in the local communication terminal side a clock source of a transmission line between said node devices in claim 1 and an invention of 2.

[0016] An invention of claim 4 provides a running clock generating means in one node device in two or more node devices in an invention of claim 1 or 2, A running clock of this node device is made into a network clock source, other node devices reproduce a clock from data received from a node device with said running clock, and data is sent out to a downstream node device.

[0017] In an invention of claim 2, an invention of claim 5 separates a means of communication which an obstacle generated, when an obstacle occurs in a part of means of communication, and. By turning up another [without an obstacle] means of communication to a means of communication

which an obstacle generated, even when an obstacle occurred, maintenance of clock relay was enabled.

[0018]An invention of claim 6 establishes two or more turning up points of a clock, and enabled it to perform said cuff in an invention of claim 5 at any two or more places of a User Network Interface or said node device.

[0019]An invention of claim 7 is constituted in an invention of claim 1 by ATM switch means by which the node device can be adapted for an ATM (Asynchronous Transfer Mode) communication method.

[0020]Two or more node devices with which distributed installation of the invention of claim 1 is carried out in two or more parts, 1 or two or more local communication terminals which are connected to each of said node device, Provide a channel means to connect with said two or more series, and a center apparatus connected to the starting point and a termination of said channel means, and said center apparatus, Transmit to said channel means and cell-ized data to said local communication terminal said each node device, Output to the local communication terminal concerned which extracted data for local communication terminals connected to the node device concerned out of said cell-ized data from said channel means, and. A multiplexing transmitting means which said each node device multiplexes data from said local communication terminal connected to the node device concerned and data from said channel means lower stream, and is sent out to said channel means is provided, In [can apply to a management communications system which collects data from said each local communication terminal by receiving data sent out to said channel from this multiplexing transmitting means, and] this managerial system, From the upper stream, a clock is extracted, and it reproduces for example, by a PLL (phase lock loop) circuit, from a received signal, and can be used as transmission timing of cell-ized data to the lower stream.

[0021]By a means's of communication extracting a clock, reproducing it by the PL circuit L, from said received signal, uniquely uniquely [each / of 2 circuit **** and its means of communication], and then considering it as transmission timing of cell-ized data to a means of communication in an invention of claim 2, Clock relay with which the clock relay direction of two circuits disagrees can be carried out.

[0022]In an invention of claim 3, a net of a career can be accommodated in a portion located in a local communication terminal, and a clock extracted from the net can be made into a clock source of the 2 circuit ***** above-mentioned means of communication uniquely between communication apparatus.

[0023]In a network with which what can serve as clock sources, such as a net of a career, does not exist in a portion located in a local communication terminal in an invention of claim 4, One node device in the network is operated with a running clock, and it is considered as a clock source of the 2 circuit ***** above-mentioned means of communication, and by PLL, the remaining node devices can extract a clock and can be reproduced.

[0024]Since it becomes impossible to extract a clock and to reproduce in an invention of claim 5 from a means of communication which an obstacle generated when an obstacle occurs in a part of means of communication, By inputting a clock extracted and reproduced into extraction of a clock connected to a means of communication which an obstacle generated, and reproduction portions from a means of communication which an obstacle has not generated, it turns up and continues before a fault occurrence portion, and communication can be secured now.

[0025]In an invention of claim 6, improvement in the speed of a cuff at the time of a fault occurrence is attained by preparing two or more points by return, and a fault occurrence at the time of a clock of a clock extraction portion changing at the time of failure restoration can be made into the minimum.

[0026]By tying a data source of release and a data processing center with an invention of claim 7 with a distributed type switch, applying to a communications system which connected between switch components with a channel using ATM art, and relaying a clock from the upper stream to the

lower stream, A single clock in a system is made into a clock source, all systems can be operated with the same clock, and a synchronization of AAL1 method of ATM can be taken now.

[0027]

[Embodiment of the Invention] Hereafter, the 1 embodiment of this invention is described in detail with reference to an accompanying drawing. Drawing 1 is a figure showing the outline composition of the communications system concerning the 1 embodiment of this invention, Pass downstream the signal which distributed installation is carried out via the center switch component 1 and the transmission line 3 which manage the whole switch, and is sent from the upper stream through this transmission line 3, and. It is constituted by two or more switch components 2 which send and receive information between local communication terminals (not shown) via the input/output port 4. In this this invention system, the clock synchronization control means 10a and 10b are formed in the center switch component 1 (it is hereafter called a center apparatus for short) and the switch component 2 (it is called ** and a node device for short), respectively. These clock synchronization control means 10a and 10b, It has a PLL (phase lock loop) circuit, and from the signal received from the upper stream, a clock is extracted, it reproduces by a PLL circuit, and clock synchronization control used as transmission timing of the cell-ized data to the lower stream is performed so that it may mention later.

[0028] Drawing 2 shows the clock distribution diagram of a portion including the above-mentioned PLL circuit in the node device 2. Drawing 3 is a figure showing the functional constitution of the portion concerning the clock synchronization control by the above-mentioned PLL circuit in the node device 2, and drawing 4 is a figure showing the functional constitution of the portion concerning the clock synchronization control by the above-mentioned PLL circuit in the center apparatus 1 similarly.

[0029] The PLL composition concerning this invention is applied to the center apparatus 1 and the node device 2, respectively, possesses at least three PLL circuits of PLL circuit 11 and PLL circuit 12 in the node device 2, and PLL circuit 15 in the center apparatus 1, and is constituted so that drawing 2 - drawing 4 may also show. PLL circuit 15 in the center apparatus 1 exists every input/output port 4. The node device 2 is provided with the clock selection means 13, and it is constituted so that the clock source of the input/output port 4 can be chosen from either above-mentioned PLL circuit 11 or PLL circuits 12. In this system, by this the clock source of the local communication terminal accommodated in the node device 2 via the above-mentioned input/output port 4, The output clock of either PLL circuit 11, PLL circuit 12, PLL circuit 15 and the oscillator 14 (refer to drawing 2) for running by itself can be used as a clock master.

[0030] In the node device 2 (or center apparatus 1) in drawing 3, for every device, two of PLL circuits 11 and 12 for clock synchronization are provided, and PLL circuits 11 and 12 which exist these two extract a clock from the signal received from the lower stream or the upper stream, respectively. Let the extracted clock be a transmit clock of the transmission line 3 where the received transmission line 3 is opposite. In this way, a clock can be relayed from the upper stream to the lower stream and the upper stream from the lower stream.

[0031] The node device 2 can supply one of the clocks of the above to a local communication terminal through the input/output port 4 by using the clock selection means 13 which chooses the clock extracted from the transmission line 3 by PLL circuit 11 or PLL circuit 12. For this reason, the clock in a network is supplied also to a local communication terminal, and it becomes possible to operate this local communication device with the clock of the same clock source.

[0032] Next, the case where the net etc. of the career accommodated in the local communication terminal side are made into a clock source is explained. Drawing 4 makes the net 17 of a career a clock master in the center apparatus 1, the example in the case of considering it as the master clock in a network is shown, and all the devices in a network operate in this case synchronizing with the above-mentioned master clock.

[0033] In drawing 4, the center apparatus 1 extracts a clock from the signal received from the net 17

by PLL circuit 15. This extracted clock is inputted into PLL circuit 11 and PLL circuit 12. Here, since PLL circuit 11 and PLL circuit 12 have composition which outputs the inputted clock as a transmit clock of each transmission line 3, they can use as the master clock of the transmission line 3 the clock extracted from the net 17 of the career.

[0034]In the other node devices 2, it becomes possible to extract the clock from the net 17 of the career supplied via the transmission line 3 concerned, and to operate by setting it as the operational mode which extracts a clock from the above-mentioned transmission line 3. By setting one of two or more node devices 2 in a system as the mode in which it operates with the oscillator 14 for running by itself, and setting the other node devices 2 as the operational mode which extracts a clock from the transmission line 3, It becomes possible to extract the self traveling oscillation machine clock of the node device 2 set as the mode in which it operates with the above-mentioned oscillator 14 for running by itself supplied via the transmission line 3, and to operate.

[0035]Next, when the transmission line 3 becomes an obstacle, how to turn up a clock and to secure communication is explained with reference to drawing 5. As shown in drawing 5, when the obstacle (part shown by x seal) 20 occurs on the transmission line 3, in the node device 2 which extracts a clock from the transmission line 3 which this obstacle 20 generated, and operates. An obstacle (clock stop) occurs in response to the influence of the above-mentioned obstacle 20 in the PLL circuit of one of the two of PLL circuit 11 or 12. At this time, the transmission in center apparatus 1 direction from the node device 2 influenced by the above-mentioned obstacle 20 becomes impossible. In this case, the transmission line 3 is controlled by the adjoining node device 2 in the state 30a and 30b by return as a hindrance avoidance means, and communication is secured with it by separating the transmission line 3 which the above-mentioned obstacle 20 generated.

[0036]Then, it can consider losing a clock source, just as it ends a cuff of the transmission lines 30a and 30b, and making communication generate an obstacle by failure restoration, when canceling the above-mentioned cuff. It is drawing 6 which showed the example of composition to the node device 2 (or center apparatus 1) for making such an obstacle avoid. In this example, functional operation which does not generate an obstacle is realized by forming the clock selection means 16-1 to 16-4 in the node device 2 at the time of an obstacle, and changing the turning up point of a clock if needed.

[0037]turning up, when the obstacle 20 is recovered while [of the transmission line 30 which the obstacle 20 generates and is shown with a dashed line in drawing 6] communicating by turning up - the transmission line 30 - the usual transmission line 3 - it is necessary to return The clock at the time of a fault occurrence is supplied through the clinch transmission line 30 like the cuff of a transmission line. Therefore, at the time of failure restoration, if this clinch transmission line 30 is changed to the usual transmission line 3, an obstacle will occur in communication. In order to change so that communication may not be made to generate an obstacle, In the node device 2 shown in drawing 6, the clock selection means 16-1 to 16-4 is started at the time of an obstacle, and the clock first inputted into the clock selection means 16-1 by the clock selection means 16-3 at the time of an obstacle at the time of an obstacle maintaining a cuff of the transmission line 30 at a state as it is is chosen. Then, a cuff of the transmission line 30 is canceled and it returns to the usual communication path. When the transmission line fault mentioned above has occurred in the reverse position (transmission line 3 on the left-hand side of the node device 2) of the obstacle shown in drawing 6, after choosing the clock inputted into the clock selection means 16-3 by the clock selection means 16-1 at the time of an obstacle at the time of an obstacle, the procedure returned to the usual transmission line 3 is taken.

[0038]There is another method in selection of a clock. This method is the method of choosing the signal which PLL circuit 11 outputs by the clock selection means 16-4 at the time of an obstacle. In application of this method, when a trouble location is reverse, the output of another PLL circuit 12 will be chosen by the clock selection means 16-2 at the time of an obstacle. In the case of the former, there is an advantage that the stability of a clock for the changed clock to pass through a

PLL circuit is good. Since the PLL circuit connected to the transmission line which the obstacle generated is not used for actual communication after changing a clock in the case of the latter, after canceling a cuff of the transmission line 30, the advantage that it is verifiable that the clock of the usual transmission line 3 was recovered normally in a PLL circuit is, but. On the other hand, one cycle of the moment of changing a clock has a problem that a clock abnormality occurs. However, this problem builds PLL (synthesizer) in LSI (large scale integration circuit) used for the transmission line 3, inputs 19.44 MHz, and can solve it by using what outputs 155 MHz. These clock selections are actually realized by the microprocessor for device control.

[0039]The clock synchronization control system of above-mentioned this invention is suitable for the communications system which tied the data source of release and the data processing center with the distributed type switch, and connected between switch components with the channel using ATM art. In this communications system, to two independent means of communication, the 1st and the 2nd, of each, clock synchronization extraction, PLL for reproduction is arranged, use as the clock for transmission of the 2nd means of communication the place which uses as the clock for transmission of the 1st means of communication the clock usually extracted by the 1st means of communication, and let further the clock extracted by the 2nd means of communication be a clock for transmission of the 1st means of communication. When an obstacle occurs, the output of a PLL circuit is considered as the input of the PLL circuit of another side. Therefore, even when the means-of-communication section when the obstacle occurred is separated, when a clock can be transmitted to the 1st means of communication from the 2nd means of communication and an obstacle generates it from the 1st means of communication to the 2nd means of communication again, a clock can be turned up inside a device, and it continues, and communication can be maintained.

[0040]

[Effect of the Invention]Since the clock is relayed from the upper stream to the lower stream according to this invention as explained above, the single clock in a network can be made into a clock source, and all networks can be operated with the same clock, and it is AAL1 of ATM. The synchronization of a method can be taken now.

[0041]It can have two or more change points of a clock, and influence of the communication on [after recovery of the clock cuff at the time of disaster recovery] can be made into the minimum.

[0042]Since a clock can be drawn from the net of the career accommodated in the position of the local communication terminal, the inside of a network can be operated with the network clock of a career, and, moreover, the network clock of a career can be supplied to the local communication terminal of a communications partner.

[Translation done.]

JAPANESE

[JP,10-145366,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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PRIOR ART

[Description of the Prior Art]As a typical example of the communications system which comprises a communications network which connects them to a data processing center and a data source of release in case the source of release or data receiver of data has been arranged at linear shape, and a data receiver, A road control system, a railroad managerial system, a sewerage managerial system, an airfield managerial system, a river management system, a subway managerial system, etc. are known.

[0003]Drawing 7 is an outline lineblock diagram of these managerial systems, and especially as communication apparatus, such as the above-mentioned data receiver and a data processing center, It is an example of realization of the system concerned at the time of applying the communication apparatus which performs cell transfer using an ATM (Asynchronous Transfer Mode: Asynchronous Transfer Mode) replacement switch. In the figure, the center switch component 1 is equivalent to the above-mentioned data processing center, and the switch component 2 is equivalent to the above-mentioned data receiver. The switch component 1 and the switch component 2 are connected by the transmission line 3, and the local communication terminal equivalent to the above-mentioned data source of release etc. is further connected to each switch component 2 via the input/output port 4.

[0004]In the system of this composition, as composition for the above-mentioned center switch component 1 and the switch component 2 to gain the clock for operation, For example. [whether as shown in drawing 2, it has composition made to operate with a running clock original with each device like a local area network (LAN) and] Or as shown in drawing 3, it is common to adopt the method which uses the clock of a career as a clock master and is synchronized with this clock master.

[0005]However, in the case where it needs to be synchronized on data transfer, for example, between a data source of release and a data processing center by the cell-ized method of ATM, AAL1 Since a unific network clock was needed when adopting a method and carrying out clock reproduction, clock synchronization was not able to be realized depending on composition like the above-mentioned local area network.

[0006]In each above-mentioned managerial system, since the independent channel with which a career does not exist was used for each network node in almost all cases, necessity was not able to be used for a clock by AAL1 method like the case in a local area network, having extracted from the external career.

[0007]Since the clock system of the communication apparatus which has the conventional ATM exchange switch had taken clock synchronization only between the communication apparatus which counter, it was unsuitable for each above-mentioned managerial system.

[0008]As part of the fault measures in this kind of managerial system, when an obstacle occurs in a transmission line, separate the transmission line which the above-mentioned obstacle generated by cuff of a transmission line, and the method of securing communication is known, but. When such

control is ventured, the obstacle was restored, when returning to the usual operational mode, a clock will be lost temporarily, and it will have the serious influence for clock acquisition.

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EFFECT OF THE INVENTION

[Effect of the Invention]As explained above, in this invention, the clock is relayed from the upper stream to the lower stream.

Therefore, the single clock in a network can be made into a clock source, all networks can be operated with the same clock, and it is AAL1 of ATM. The synchronization of a method can be taken now.

[0041]It can have two or more change points of a clock, and influence of the communication on [after recovery of the clock cuff at the time of disaster recovery] can be made into the minimum.

[0042]Since a clock can be drawn from the net of the career accommodated in the position of the local communication terminal, the inside of a network can be operated with the network clock of a career, and, moreover, the network clock of a career can be supplied to the local communication terminal of a communications partner.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Thus, it is a case where the communication apparatus which uses an ATM switch performs a system construction in a system conventionally [above-mentioned], and, moreover, is AAL1. When adopting a method, It was necessary to certainly draw the network clock of a career in each node, and there was a problem that communicative stabilization was dependent on a network clock.

[0010]When separating the transmission line which the obstacle generated by cuff of a transmission line and securing communication, the obstacle was restored, and when returning to the usual operational mode, there was a problem that operation which the clock of was lost temporarily and stabilized could not be performed.

[0011]This invention removes the above-mentioned problem and an object of this invention is to provide the communications system provided with the clock synchronization method which can realize communication with AAL1 method even if there was no network clock of a career.

[0012]An object of this invention is to provide the communications system provided with the clock synchronization method which can continue the communication stable also in the cut return after a part of channel is fallen and restored with an obstacle.

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MEANS

[Means for Solving the Problem]Two or more node devices with which distributed installation of the invention of claim 1 is carried out in two or more parts, In a communications system which possesses a means of communication which connects said two or more node devices with 1 or two or more local communication terminals which are connected to each of said node device in series, and carries out the transmit receive of the cell-ized data, A clock synchronization control means which relays a clock is provided by extracting a clock from a received signal, reproducing from the upper stream, and using it as transmission timing of cell-ized data to the lower stream.

[0014]In an invention of claim 1, an invention of claim 2 a means of communication, Said 2nd means of communication by relaying said clock from the lower stream to the upper stream by doubling using two means of communication, the 1st and the 2nd, and said 1st means of communication relaying said clock from the upper stream to the lower stream, Clock relay with which the clock relay direction of said two means of communication disagrees is performed.

[0015]An invention of claim 3 makes a clock extracted from a net etc. which were accommodated in the local communication terminal side a clock source of a transmission line between said node devices in claim 1 and an invention of 2.

[0016]An invention of claim 4 provides a running clock generating means in one node device in two or more node devices in an invention of claim 1 or 2, A running clock of this node device is made into a network clock source, other node devices reproduce a clock from data received from a node device with said running clock, and data is sent out to a downstream node device.

[0017]In an invention of claim 2, an invention of claim 5 separates a means of communication which an obstacle generated, when an obstacle occurs in a part of means of communication, and. By turning up another [without an obstacle] means of communication to a means of communication which an obstacle generated, even when an obstacle occurred, maintenance of clock relay was enabled.

[0018]An invention of claim 6 establishes two or more turning up points of a clock, and enabled it to perform said cuff in an invention of claim 5 at any two or more places of a User Network Interface or said node device.

[0019]An invention of claim 7 is constituted in an invention of claim 1 by ATM switch means by which the node device can be adapted for an ATM (Asynchronous Transfer Mode) communication method.

[0020]Two or more node devices with which distributed installation of the invention of claim 1 is carried out in two or more parts, 1 or two or more local communication terminals which are connected to each of said node device, Provide a channel means to connect with said two or more series, and a center apparatus connected to the starting point and a termination of said channel means, and said center apparatus, Transmit to said channel means and cell-ized data to said local communication terminal said each node device, Output to the local communication terminal concerned which extracted data for local communication terminals connected to the node device

concerned out of said cell-ized data from said channel means, and. A multiplexing transmitting means which said each node device multiplexes data from said local communication terminal connected to the node device concerned and data from said channel means lower stream, and is sent out to said channel means is provided, In [can apply to a management communications system which collects data from said each local communication terminal by receiving data sent out to said channel from this multiplexing transmitting means, and] this managerial system, From the upper stream, a clock is extracted, and it reproduces for example, by a PLL (phase lock loop) circuit, from a received signal, and can be used as transmission timing of cell-ized data to the lower stream.

[0021]By a means's of communication extracting a clock, reproducing it by the PL circuit L, from said received signal, uniquely uniquely [each / of 2 circuit **** and its means of communication], and then considering it as transmission timing of cell-ized data to a means of communication in an invention of claim 2, Clock relay with which the clock relay direction of two circuits disagrees can be carried out.

[0022]In an invention of claim 3, a net of a career can be accommodated in a portion located in a local communication terminal, and a clock extracted from the net can be made into a clock source of the 2 circuit ***** above-mentioned means of communication uniquely between communication apparatus.

[0023]In a network with which what can serve as clock sources, such as a net of a career, does not exist in a portion located in a local communication terminal in an invention of claim 4, One node device in the network is operated with a running clock, and it is considered as a clock source of the 2 circuit ***** above-mentioned means of communication, and by PLL, the remaining node devices can extract a clock and can be reproduced.

[0024]Since it becomes impossible to extract a clock and to reproduce in an invention of claim 5 from a means of communication which an obstacle generated when an obstacle occurs in a part of means of communication, By inputting a clock extracted and reproduced into extraction of a clock connected to a means of communication which an obstacle generated, and reproduction portions from a means of communication which an obstacle has not generated, it turns up and continues before a fault occurrence portion, and communication can be secured now.

[0025]In an invention of claim 6, improvement in the speed of a cuff at the time of a fault occurrence is attained by preparing two or more points by return, and a fault occurrence at the time of a clock of a clock extraction portion changing at the time of failure restoration can be made into the minimum.

[0026]By tying a data source of release and a data processing center with an invention of claim 7 with a distributed type switch, applying to a communications system which connected between switch components with a channel using ATM art, and relaying a clock from the upper stream to the lower stream, A single clock in a system is made into a clock source, all systems can be operated with the same clock, and a synchronization of AAL1 method of ATM can be taken now.

[0027]

[Embodiment of the Invention]Hereafter, the 1 embodiment of this invention is described in detail with reference to an accompanying drawing. Drawing 1 is a figure showing the outline composition of the communications system concerning the 1 embodiment of this invention, Pass downstream the signal which distributed installation is carried out via the center switch component 1 and the transmission line 3 which manage the whole switch, and is sent from the upper stream through this transmission line 3, and. It is constituted by two or more switch components 2 which send and receive information between local communication terminals (not shown) via the input/output port 4. In this this invention system, the clock synchronization control means 10a and 10b are formed in the center switch component 1 (it is hereafter called a center apparatus for short) and the switch component 2 (it is called ** and a node device for short), respectively. These clock synchronization control means 10a and 10b, It has a PLL (phase lock loop) circuit, and from the signal received from the upper stream, a clock is extracted, it reproduces by a PLL circuit, and clock synchronization

control used as transmission timing of the cell-ized data to the lower stream is performed so that it may mention later.

[0028]Drawing 2 shows the clock distribution diagram of a portion including the above-mentioned PLL circuit in the node device 2. Drawing 3 is a figure showing the functional constitution of the portion concerning the clock synchronization control by the above-mentioned PLL circuit in the node device 2, and drawing 4 is a figure showing the functional constitution of the portion concerning the clock synchronization control by the above-mentioned PLL circuit in the center apparatus 1 similarly.

[0029]The PLL composition concerning this invention is applied to the center apparatus 1 and the node device 2, respectively, possesses at least three PLL circuits of PLL circuit 11 and PLL circuit 12 in the node device 2, and PLL circuit 15 in the center apparatus 1, and is constituted so that drawing 2 - drawing 4 may also show. PLL circuit 15 in the center apparatus 1 exists every input/output port 4. The node device 2 is provided with the clock selection means 13, and it is constituted so that the clock source of the input/output port 4 can be chosen from either above-mentioned PLL circuit 11 or PLL circuits 12. In this system, by this the clock source of the local communication terminal accommodated in the node device 2 via the above-mentioned input/output port 4, The output clock of either PLL circuit 11, PLL circuit 12, PLL circuit 15 and the oscillator 14 (refer to drawing 2) for running by itself can be used as a clock master.

[0030]In the node device 2 (or center apparatus 1) in drawing 3, for every device, two of PLL circuits 11 and 12 for clock synchronization are provided, and PLL circuits 11 and 12 which exist these two extract a clock from the signal received from the lower stream or the upper stream, respectively. Let the extracted clock be a transmit clock of the transmission line 3 where the received transmission line 3 is opposite. In this way, a clock can be relayed from the upper stream to the lower stream and the upper stream from the lower stream.

[0031]The node device 2 can supply one of the clocks of the above to a local communication terminal through the input/output port 4 by using the clock selection means 13 which chooses the clock extracted from the transmission line 3 by PLL circuit 11 or PLL circuit 12. For this reason, the clock in a network is supplied also to a local communication terminal, and it becomes possible to operate this local communication device with the clock of the same clock source.

[0032]Next, the case where the net etc. of the career accommodated in the local communication terminal side are made into a clock source is explained. Drawing 4 makes the net 17 of a career a clock master in the center apparatus 1, the example in the case of considering it as the master clock in a network is shown, and all the devices in a network operate in this case synchronizing with the above-mentioned master clock.

[0033]In drawing 4, the center apparatus 1 extracts a clock from the signal received from the net 17 by PLL circuit 15. This extracted clock is inputted into PLL circuit 11 and PLL circuit 12. Here, since PLL circuit 11 and PLL circuit 12 have composition which outputs the inputted clock as a transmit clock of each transmission line 3, they can use as the master clock of the transmission line 3 the clock extracted from the net 17 of the career.

[0034]In the other node devices 2, it becomes possible to extract the clock from the net 17 of the career supplied via the transmission line 3 concerned, and to operate by setting it as the operational mode which extracts a clock from the above-mentioned transmission line 3. By setting one of two or more node devices 2 in a system as the mode in which it operates with the oscillator 14 for running by itself, and setting the other node devices 2 as the operational mode which extracts a clock from the transmission line 3, It becomes possible to extract the self traveling oscillation machine clock of the node device 2 set as the mode in which it operates with the above-mentioned oscillator 14 for running by itself supplied via the transmission line 3, and to operate.

[0035]Next, when the transmission line 3 becomes an obstacle, how to turn up a clock and to secure communication is explained with reference to drawing 5. As shown in drawing 5, when the obstacle (part shown by x seal) 20 occurs on the transmission line 3, in the node device 2 which

extracts a clock from the transmission line 3 which this obstacle 20 generated, and operates. An obstacle (clock stop) occurs in response to the influence of the above-mentioned obstacle 20 in the PLL circuit of one of the two of PLL circuit 11 or 12. At this time, the transmission in center apparatus 1 direction from the node device 2 influenced by the above-mentioned obstacle 20 becomes impossible. In this case, the transmission line 3 is controlled by the adjoining node device 2 in the state 30a and 30b by return as a hindrance avoidance means, and communication is secured with it by separating the transmission line 3 which the above-mentioned obstacle 20 generated. [0036] Then, it can consider losing a clock source, just as it ends a cuff of the transmission lines 30a and 30b, and making communication generate an obstacle by failure restoration, when canceling the above-mentioned cuff. It is drawing 6 which showed the example of composition to the node device 2 (or center apparatus 1) for making such an obstacle avoid. In this example, functional operation which does not generate an obstacle is realized by forming the clock selection means 16-1 to 16-4 in the node device 2 at the time of an obstacle, and changing the turning up point of a clock if needed.

[0037] turning up, when the obstacle 20 is recovered while [of the transmission line 30 which the obstacle 20 generates and is shown with a dashed line in drawing 6] communicating by turning up - the transmission line 30 — the usual transmission line 3 — it is necessary to return The clock at the time of a fault occurrence is supplied through the clinch transmission line 30 like the cuff of a transmission line. Therefore, at the time of failure restoration, if this clinch transmission line 30 is changed to the usual transmission line 3, an obstacle will occur in communication. In order to change so that communication may not be made to generate an obstacle, In the node device 2 shown in drawing 6, the clock selection means 16-1 to 16-4 is started at the time of an obstacle, and the clock first inputted into the clock selection means 16-1 by the clock selection means 16-3 at the time of an obstacle at the time of an obstacle maintaining a cuff of the transmission line 30 at a state as it is is chosen. Then, a cuff of the transmission line 30 is canceled and it returns to the usual communication path. When the transmission line fault mentioned above has occurred in the reverse position (transmission line 3 on the left-hand side of the node device 2) of the obstacle shown in drawing 6, after choosing the clock inputted into the clock selection means 16-3 by the clock selection means 16-1 at the time of an obstacle at the time of an obstacle, the procedure returned to the usual transmission line 3 is taken.

[0038] There is another method in selection of a clock. This method is the method of choosing the signal which PLL circuit 11 outputs by the clock selection means 16-4 at the time of an obstacle. In application of this method, when a trouble location is reverse, the output of another PLL circuit 12 will be chosen by the clock selection means 16-2 at the time of an obstacle. In the case of the former, there is an advantage that the stability of a clock for the changed clock to pass through a PLL circuit is good. Since the PLL circuit connected to the transmission line which the obstacle generated is not used for actual communication after changing a clock in the case of the latter, after canceling a cuff of the transmission line 30, the advantage that it is verifiable that the clock of the usual transmission line 3 was recovered normally in a PLL circuit is, but. On the other hand, one cycle of the moment of changing a clock has a problem that a clock abnormality occurs. However, this problem builds PLL (synthesizer) in LSI (large scale integration circuit) used for the transmission line 3, inputs 19.44 MHz, and can solve it by using what outputs 155 MHz. These clock selections are actually realized by the microprocessor for device control.

[0039] The clock synchronization control system of above-mentioned this invention is suitable for the communications system which tied the data source of release and the data processing center with the distributed type switch, and connected between switch components with the channel using ATM art. In this communications system, to two independent means of communication, the 1st and the 2nd, of each, clock synchronization extraction, PLL for reproduction is arranged, use as the clock for transmission of the 2nd means of communication the place which uses as the clock for transmission of the 1st means of communication the clock usually extracted by the 1st means of

communication, and let further the clock extracted by the 2nd means of communication be a clock for transmission of the 1st means of communication. When an obstacle occurs, the output of a PLL circuit is considered as the input of the PLL circuit of another side. Therefore, even when the means-of-communication section when the obstacle occurred is separated, when a clock can be transmitted to the 1st means of communication from the 2nd means of communication and an obstacle generates it from the 1st means of communication to the 2nd means of communication again, a clock can be turned up inside a device, and it continues, and communication can be maintained.

[Translation done.]

* NOTICES *

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- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The outline lineblock diagram of the communications system concerning the 1 embodiment of this invention.

[Drawing 2]The clock distribution diagram of the node device in drawing 1

[Drawing 3]The figure showing the functional constitution of the node device in drawing 1.

[Drawing 4]The figure showing the functional constitution of the center apparatus in drawing 1.

[Drawing 5]The figure showing an example of a transmission-line cuff state at the time of the obstacle of the communications system in drawing 1.

[Drawing 6]The figure showing the example of composition of a node device useful to the prevention from clock discontinuation at the time of failure restoration.

[Drawing 7]The outline lineblock diagram of the communications system constituted by a distributed installation type ATM switch.

[Drawing 8]A system configuration figure in case each device of the communications system in drawing 7 operates with a running clock.

[Drawing 9]A system configuration figure in case each device of the communications system in drawing 7 operates synchronizing with the net of a career.

[Description of Notations]

1 Center switch component (center apparatus)

2 Switch component (node device)

3 Transmission line

4 Input/output port

10a, 10b clock synchronization control means

11, 12, 15 PLL circuits

13, 13-1, —, 13-5 clock selection means

14 The oscillator for running by oneself

16-1,16-2 and 16-3,16-4 — the time of an obstacle — a clock selection means

17 The net of a career

20 Trouble generation place

30 It is a clinch transmission line at the time of an obstacle.

[Translation done.]

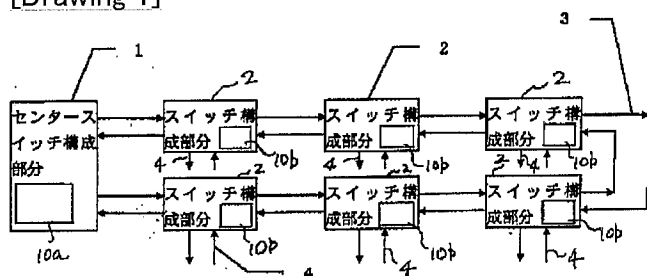
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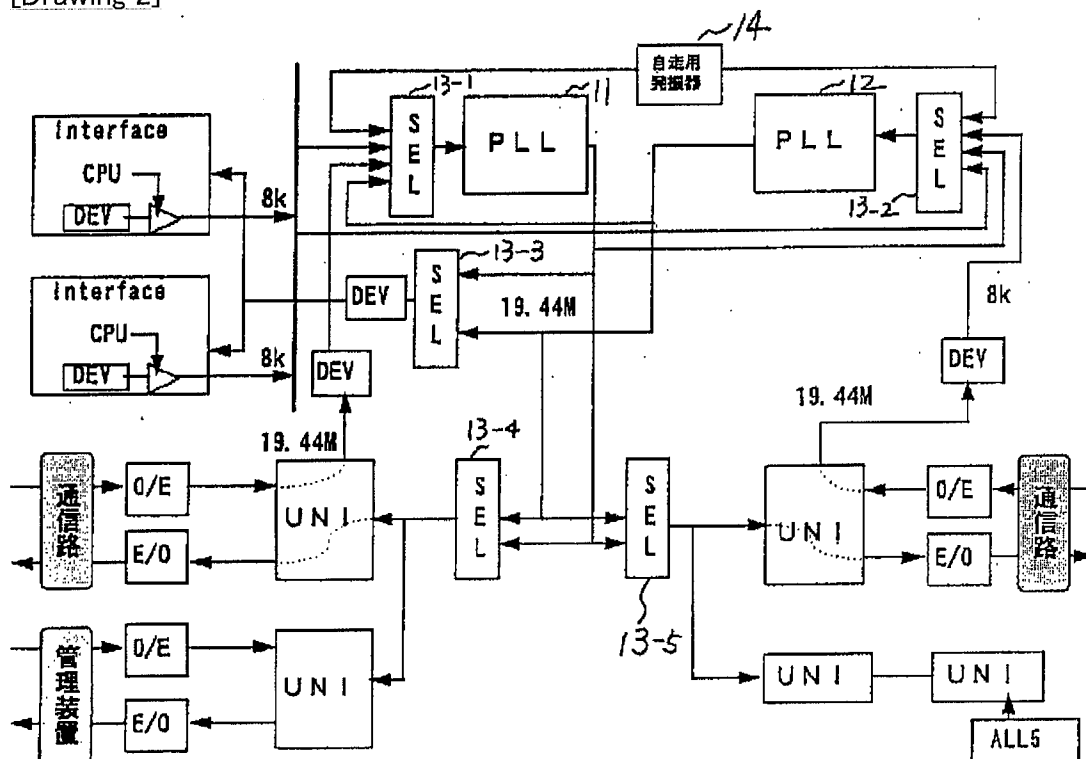
3. In the drawings, any words are not translated.

DRAWINGS

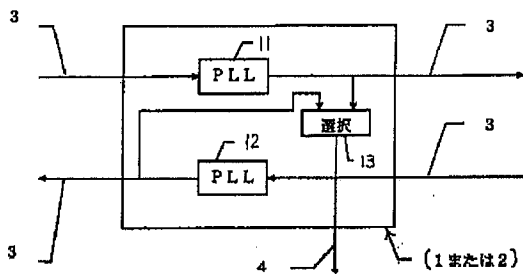
[Drawing 1]



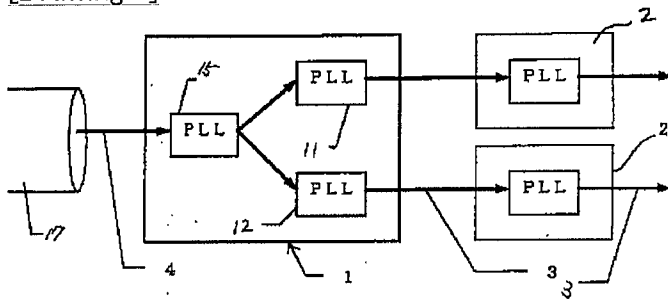
[Drawing 2]



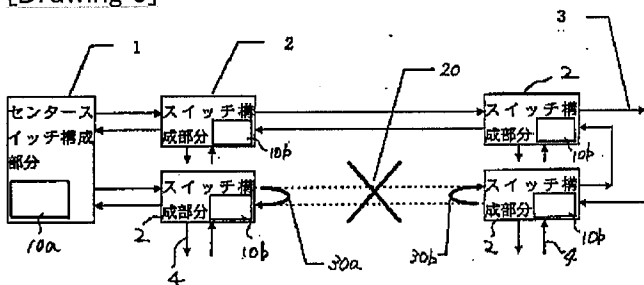
[Drawing 3]



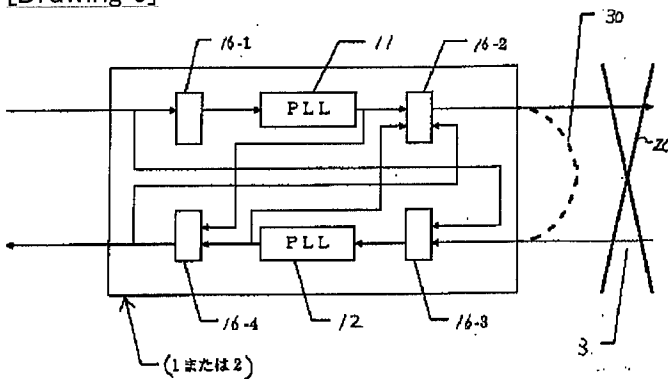
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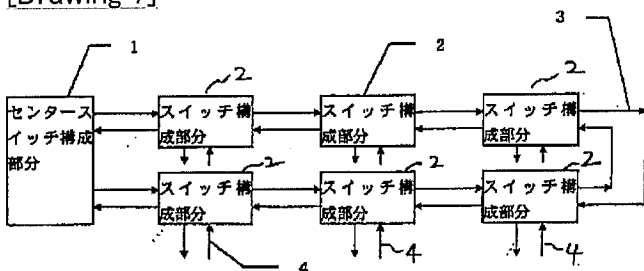
[Drawing 5]



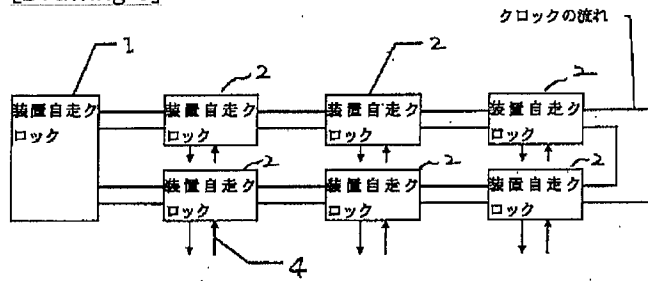
[Drawing 6]



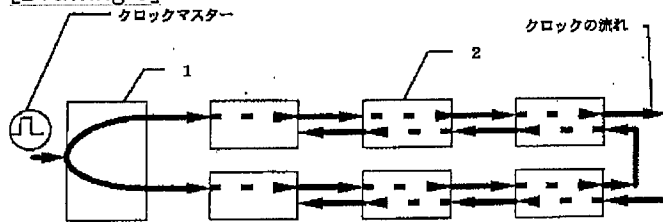
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]